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resolution, one parallel to, and one perpendicular to the flight line have been used with test targets to determine the amount of uncompensated image motion. The extension of this technique to scenes which do not contain test targets will be investigated.

Attention has also been given to determining the influence of the following quantities upon the output of the microdensitometer:

1) the degree of coherence of the light illuminating the object,
2) the quality of the imaging optics of the analytical microscope, and
3) the type and size of the scanning aperture employed.

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The starting point chosen to study these factors uses the results of [redacted][1] The image of a sharp edge is currently being evaluated. Initially, the assumption has been made that the analytical microscope is diffraction limited. Since it is customary to match the numerical apertures of both objectives in the microdensitometer, this case will be treated first.

A literature search of grain scattering effects has revealed little on the dependence of granularity with specularity and, in fact, on the grain scattering problem in general. Data on density variations with specularity are lacking, although the variations are understood in a general way. An experiment has been designed to measure density values for various films as both the input and output numerical apertures are varied. For each film a step wedge will be scanned with the [redacted] microdensitometer using combinations of objectives with various numerical apertures. A large scanning aperture will be used.

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II. Equipment Capability

A survey of existing instruments is in progress. The results to date are listed in Table I.

The establishment of microdensitometer evaluation techniques has been initiated. Specific tests which would determine the transfer function of the microdensitometer system, the system sensitivity, and linearity are being considered. Primary attention during the last month has been given to development of test targets for the determination of the system transfer function.

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1 [redacted]

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Since the optics of microdensitometers are the highest resolution optics available, the technique under study for checking the quality of test charts involves measurements of the diffraction pattern generated when the test chart is illuminated by a point source. Edge targets and sine wave targets are being investigated.

III. Feasibility Studies

During this month the effort on this task has been directed toward standards, light sources, and detectors.

Requirements for suitable optical density standards have been considered. Investigation of standards for determining system transfer function were described under Task II.

A preliminary investigation of light sources and detectors has been conducted. Methods of reducing detector noise were studied. A comparison of tungsten, mercury and laser light sources was conducted assuming a small circular aperture, with the smallest numerical aperture providing adequate resolution for that aperture and a photomultiplier tube detector with S-4 response. Compared to the illumination of the tungsten source, the brightest mercury source currently available was found to be about 100 times as effective and a 20 milliwatt laser source was about 10^5 times as effective.

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